APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/855,292	05/14/2001	William W. Macy JR.	10559-398001/P10335	1919

20985 7590 03/15/2004		EXAMINER	
FISH & RICHARDSON, PC		ROSARIO-VASQUEZ, DENNIS	
12390 EL CAMINO REAL		ART UNIT	PAPER NUMBER
SAN DIEGO, CA 92130-2081		2621	

DATE MAILED: 03/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _14 May 2001_.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-30_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-30_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _14 May 2001_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _3_.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2.   Claims 1,2,5,6 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by

Wong (U.S. Patent 5,506,699 A).

Regarding claim 1, Wong discloses a method of enhancing an image,

comprising:

smoothing (fig. 2, num. 20) the image (fig. 2, label "Ym,n) to produce a smoothed

image (Fig. 2, label T(Ym,n)); and

performing low pass filtering (fig. 3, num. 26) on the smoothed image (fig. 3,

num. 24 or fig. 2) to produce an enhanced image (fig. 3, label "GRAY SCALE IMAGE").

Wong states," In a preferred embodiment, errors generated during either a halftoning

process or an inverse half-toning process are removed and a high quality gray scale

image is constructed by using a pipeline of stages, with each stage having both low

pass filtering and non-linear statistical smoothing (col. 3 lines 2-7)."

Regarding claim 2, Wong discloses the method of claim 1, wherein smoothing

comprises:

applying a two-dimensional filter to a pixel in the image (A 3 by 3 window with a

central pixel is used at col. 5 lines 25-27 and col. 6 lines 27,28).;

storing a pixel processed by the two-dimensional filter in the smoothed image

(Wong states," The superscripts "old" and "new" refer to the value of the center pixel

before and after, respectively, each statistical smoothing process along the pipeline of

FIG. 3 (col. 5 lines 45-47)."). Therefore old values of the central pixel are used to

compute new central pixels according to the equation located in col. 5 lines 38-

44; and

repeating storing and applying for one or more other pixels in the image. Wong

states," The operation is repeated on a pixel-by-pixel basis over the entire image,

wherein the window that defines neighborhood "slides" across the image (col. 5 lines

47-50)."

Regarding claim 5, Wong discloses the method of claim 1, further comprising

detecting an edge in the smoothed image (Wong uses a variance formula for

determining edges at col. 6 lines 12-15.);

wherein low pass filtering is performed only on non-edge areas of the smoothed

image (Wong states,"...the purpose of the low pass filter at each stage is to remove

the...unwanted high frequency components that are generated by the non-linear

smoothing process...The low pass filter may be a halfband filter to avoid overly blurring

the reconstructed image (col. 5 lines 13-18)." Furthermore, Wong states,"...[The]

smoothing operation provides a gray scale image without overly blurring the image at its

edges (col. 6, lines 18-20).") Therefore, the low pass filter operates only in regions that

will be blurred by the smoothing operation.

Regarding claim 6, Wong discloses the method of claim 5, wherein detecting the edge comprises applying an edge filter to the smoothed image. (A neighborhood of pixels within the stage of filters of figure 3, numeral 22 and 24 are used with a central pixel in the window that is used to detect the edge at col. 5 lines 25-27 and col. 6, lines 12-15.)

Regarding claim 9, Wong discloses a method of performing inverse halftoning (Wong states," With reference to FIG. 2, a stage of a pipeline apparatus for inverse halftoning is shown (col. 5, lines 6,7).") on a halftoned image (The output of figure 1, label:"b subscript m,n" is a halftone image (col. 4, line 51) that is used as an input for figure 2, label: "y subscript m,n" at col. 5, lines 4-6.) and the additional elements that were addressed in claims 2 and 5.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong (US Patent 5,506,699 A) and in view of Seidner et al. (US Patent 5,333,064 A).

Regarding claim 4, Wong teaches the use of a cut-off frequency for low-pass filtering at col. 5 lines 19-23.

Wong does not teach a low-pass filter having a sharp high-frequency cut-off.

However, Seidner et al. does teach, in the filed of endeavor of desrceening or inverse halftoning, a Hamming filter that can be used for screen removal at col. 3 lines 58-62. According to the instant application a Hamming filter includes a sharp cut-off frequency.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the low-pass filter of Wong with the teaching of Seidner et al.'s Hamming filter because the Hamming filter can perform calculations "on-the-fly" at col. 3 lines 54-57. Therefore the filter calculations can continue without stopping the calculation process in order to change a filter parameter at col. 3, lines 56-58 .

5.   Claims 3,7,8,10-13,15-23 and 25-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong (US Patent 5,506,699 A) and in view of Fan (US Patent 5,027,078 A).

Regarding claim 3, Wong teaches all the elements of claim 3, which are addressed in claim 2 above, except for the additional element of using a one-dimensional filter.

However, Fan does teach, in the field of endeavor of unscreening, a one-dimensional filter from col. 5, line 50 to col..8 line 7.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use Fan's one-dimensional filter as a modification to Wong's two-dimensional filter because Fan teaches that a one-dimensional and two dimensional filter are "equivalently implemented (col. 8, line 39)."

Regarding claim 7, Wong does not teach applying a median filter to the

enhanced image, but Wong does suggest later image processing as indicated in figure

3, num. 28.

According to the specification at page 8, lines 19-21: "The median filter may also

be an NXN filter, which is applied in the manner described above...", Wong does teach

the use of applying a median filter. Therefore the low pass filter of Wong is a median

filter, which "are conventionally used in the art of inverse halftoning, so that the

configuration of the filters is readily understood (col. 5 lines 21-23)." However, Wong

does not teach applying the low pass filter to an enhanced image.

Additionally, Wong does not teach the remaining portions of claim 7.

However, Fan does teach the remaining portion of claim 7 of applying an

averaging filter or "optional smoothing process" to the enhanced image or

"reconstructed continuous tone image" at col. 8 lines 19-31.;

wherein the averaging filter is designed to reduce artifacts on the enhanced

image (Using figure 1, Fan states, "An optional smoothing process, block 22, may be

employed to eliminate the coarse quantization artifacts caused by the original halftoning

process (col. 2 line 64-67).").

Claim 8 has been addressed in claim 5 above.

Claim 10 has been addressed in claims 7 and 8 above.

It would have been obvious at the time the invention was made to one of ordinary

skill in the art to use Wong's teaching of a later image processing stage and the use of

the low pass filter for inverse halftoning with Fan's optional smoothing as the later stage

of Wong, because further smoothing "may be employed to eliminate the coarse

quantization artifacts...These artifacts are evident within the...areas of the logic filter

continuous tone output image (Fan, from col. 2, line 64 to col. 3 line 1)."

Regarding claims 11-13 and 15-18, which are similar to claims 1-3 and 5-8,

respectively, except for requiring an article comprising a machine-readable medium that

stores machine-executable instructions for enhancing an image.

Wong does not teach the article as required by claims 11-13 and 15-18, but

teaches an algorithm that can be used with inverse halftoning as prior art at col. 1, lines

60-67.

However, Fan does teach the use of an algorithm for unscreening or inverse

halftoning at col. 2, lines 54,55.

Claims 19 and 20 have been addressed in claims 9 and 10 above except for

requiring the article which was addressed in claims 11-13 and 15-18 above.

Claim 21 was addressed in claim 1 above except for requiring an apparatus

(Wong, fig. 3 teaches an apparatus) comprising:

Wong does not teach the additional elements of claim 21.

However, Fan does teach a memory that stores executable instructions (Fig. 3A

is an algorithm that has a memory located at numeral 210.); and

a processor that executes the instructions (Fan, figure 1 shows "major

processing blocks" that would inherently be used by a processor at Fan, col. 2,line 54).

Claims 22,23,25,26,27 and 28 have been addressed in claims 2,3,5,6,7 and

8 above, respectively.

Regarding claim 29, Wong discloses an apparatus (Fig. 3) and the additional elements were addressed in claims 9 and 21 above.

Claim 30 was addressed in claim 10 above.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use the algorithm of Fan to modify Wong's invention with the teaching of an inverse halftoning algorithm in the prior art because "a flexible unscreening algorithm capable of incorporating additional functionality so as to enable customization of the unscreening process according to the output effects desired, for example, modification of the tonal reproduction curve (TRC) used to produce the continuous tone output image (Fan, col. 2 lines 6-12)."

6.   Claims 14 and 24 rejected under 35 U.S.C. 103(a) as being unpatentable over Wong (US Patent 5,506,699 A) and in view of Fan (US Patent 5,027,078 A) as applied to claims 11 and 21 above, and further in view of Seidner et al. (US Patent 5,333,064 A).

Claims 14 and 24 have been addressed in claim 4 above.

Conclusion

7.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Zhang et al. (US Patent 6,201,613 B1) is pertinent as teaching a method of enhancing an image using a low pass filter at col. 1, lines 32-35.

Sorimachi et al. (US Patent 5,166,810 A) is pertinent as teaching a method of a low pass filter that smooths images for enhancement at col. 2 lines 38-44.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Rosario-Vasquez whose telephone number is 703-305-5431. The examiner can normally be reached on 9-5.

8.   If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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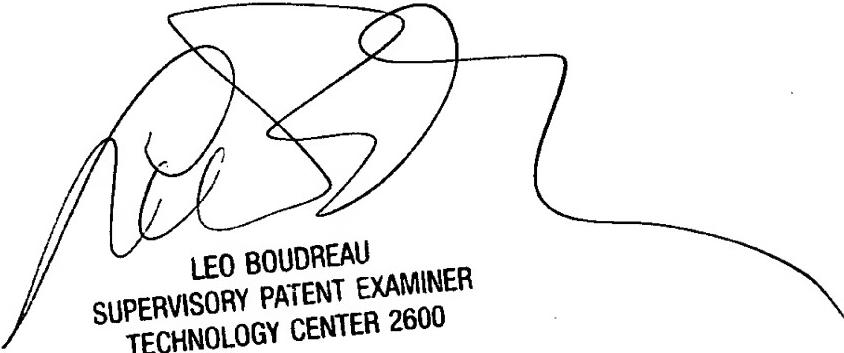
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